PROCEEDINGS

OF THE

ROYAL SOCIETY OF LONDON

SERIES A

CONTAINING PAPERS OF A MATHEMATICAL AND PHYSICAL CHARACTER.

VOL. XCVI.

LONDON:

PRINTED FOR THE ROYAL SOCIETY AND SOLD BY
HARRISON AND SONS, ST. MARTIN'S LANE,
PRINTERS IN ORDINARY TO HIS MAJESTY.

FEBRUARY, 1920.

LONDON
HARRISON AND SONS, PRINTERS IN ORDINARY TO HIS MAJESTY,
ST. MARTIN'S LANE.

CONTENTS.

SERIES A. VOL. XCVI.

No. A 674.—August 1, 1919.

PAGE

Zonal Harmonics of High Order in Terms of Bessel Functions. By John R. Airey, M.A., D.Sc. Communicated by Prof. J. W. Nicholson, F.R.S. 1

Atmospheric Stirring Measured by Precipitation. By Lewis F. Richardson. Communicated by Sir Napier Shaw, F.R.S. 9

Measurement of Water in Clouds. By L. F. Richardson. Communicated by Sir Napier Shaw, F.R.S. 19

Magnetic Storms of March 7–8 and August 15–16, 1918, and their Discussion. By C. Chree, Sc.D., LL.D., F.R.S. 32

On the Inter-crystalline Fracture of Metals under Prolonged Application of Stress (Preliminary Paper). By Walter Rosenhain, B.A., D.Sc., F.R.S., and Sydney L. Archbutt, F.I.C. (both of the National Physical Laboratory). (Plates 1–3.) 55

On the Determination of the Secular Acceleration of the Moon's Longitude from Modern Observations. By Ernest W. Brown, F.R.S. 69

On the Area of Surfaces. By Prof. W. H. Young, Sc.D., F.R.S. 71

On Change of the Independent Variables in a Multiple Integral. By Prof. W. H. Young, Sc.D., F.R.S. 82

No. A 675.—September 4, 1919.

On Certain Independent Factors in Mental Measurements. By J. C. Maxwell Garnett (late Fellow of Trinity College, Cambridge). Communicated by Prof. A. N. Whitehead, F.R.S. 91

Note on the Intensity Decrement in the Balmer Series. By T. R. Merton, D.Sc., and J. W. Nicholson, F.R.S. 112

Researches on the Chemistry of Coal. Part I.—The Action of Pyridine upon the Coal Substance. By William A. Bone, D.Sc., F.R.S., and Reginald J. Sarjant, M.Sc. 119

A Study of Catalytic Actions at Solid Surfaces. I.—Hydrogenation of Unsaturated Fats in the Liquid State in Presence of Nickel. By E. F. Armstrong, D.Sc., F.I.C., and T. P. Hilditch, D.Sc., F.I.C. Communicated by Prof. H. E. Armstrong, F.R.S. 137

The Value of the Rydberg Constant for Spectral Series. By W. E. Curtis, B.Sc., Demonstrator of Astrophysics at the Imperial College of Science, South Kensington. Communicated by Prof. A. Fowler, F.R.S. 147

Monoclinic Double Selenates of the Cobalt Group. By A. E. H. Tutton, D.Sc., M.A., F.R.S. 156

PAGE

No. A 676.—October 9, 1919.

The Transparency of Biotite to Infra-red Radiations. By L. C. Martin, A.R.C.S., D.I.C., B.Sc., Lecturer in the Technical Optics Department, Imperial College of Science and Technology. Communicated by Prof. H. L. Callendar, F.R.S... 185

Experiments with Perforated Electrodes on the Nature of the Discharge in Gases at Low Pressures. By F. W. Aston, M.A., D.Sc., Clerk-Maxwell Student of the University of Cambridge. Communicated by C. T. R. Wilson, F.R.S. 200

De Saint-Venant Solution for the Flexure of Cantilevers of Cross-section in the form of Complete and Curtate Circular Sectors, and on the Influence of the Manner of Fixing the Built-in End of the Cantilever on its Deflection. By Mary Seegar, B.Sc., and Karl Pearson, F.R.S. 211

On the Relation between Wind and Distribution of Pressure. By Harold Jeffreys, M.A., D.Sc. Communicated by Sir Napier Shaw, F.R.S. 233

On a New Method of Driving off Poisonous Gases. By Mrs. Hertha Ayrton. Communicated by Prof. T. Maher, F.R.S. (Plate 4) 249

No. A 677.—November 1, 1919.

On the Colours of the Striæ in Mica, and the Radiation from Laminar Diffracting Boundaries. By Phanindra Nath Ghosh, M.A., Lecturer on Optics in the Calcutta University. Communicated by Dr. Gilbert T. Walker, C.S.I., Sc.D., F.R.S. 257

Diffusion of Light by Rain, Cloud, or Fog. By A. Mallock, F.R.S. 267

Bakerian Lecture: A Study of the Line Spectrum of Sodium as Excited by Fluorescence. By the Hon. R. J. Strutt, F.R.S., Imperial College, South Kensington. (Plate 5) 272

The Adsorption of Gases at Low and Moderate Concentrations. Part I.—Deduction of the Theoretical Adsorption Isostere and Isotherm. Part II.—Experimental Verification of the Form of the Theoretical Isosteres and Isotherms. By A. M. Williams, M.A., D.Sc., Chemistry Department, University of Edinburgh. Communicated by Prof. James Walker, F.R.S. 287

The Adsorption of Gases at Low and Moderate Concentrations. Part III.—Experimental Verification of the Constants in the Theoretical Adsorption Isostere. By A. M. Williams, M.A., D.Sc., Chemistry Department, University of Edinburgh. Communicated by Prof. James Walker, F.R.S. 298

No. A 678.—December 15, 1919.

Address of the President, Sir J. J. Thomson, O.M., at the Anniversary Meeting, December 1, 1919 311

A Study of Catalytic Actions at Solid Surfaces. II.—The Transference of Hydrogen from Saturated to Unsaturated Organic Compounds in the Liquid State in Presence of Metallic Nickel. By Dr. E. F. Armstrong, F.I.C., and Dr. T. P. Hilditch, F.I.C. Communicated by Prof. H. E. Armstrong, F.R.S. 322

Tidal Friction in the Irish Sea. By G. I. Taylor, M.A. Communicated by Sir Napier Shaw, F.R.S. (Abstract) 330

PAGE

A Linear Associative Algebra suitable for Electromagnetic Relations and the Theory of Relativity. By W. J. Johnston, M.A., Assistant Professor of Pure Mathematics in the University College of Wales, Aberystwyth. Communicated by Sir Joseph Larmor, F.R.S. 331

On Generalized Relativity in Connection with Mr. W. J. Johnston's Symbolic Calculus. By Sir Joseph Larmor, F.R.S., Cambridge 334

No. A 679.—January 2, 1920.

On the Variation with Frequency of the Conductivity and Dielectric Constant of Dielectrics for High-Frequency Oscillations. By G. E. Bairsto, D.Sc., D.Eng. Communicated by Prof. J. A. Fleming, F.R.S. 363

On the Secondary Spectrum of Hydrogen. By T. R. Merton, M.A., D.Sc. Communicated by Prof. A. Fowler, F.R.S. (Plates 6 and 7) 382

On the Spectra of Isotopes. By T. R. Merton, M.A., D.Sc. Communicated by Prof. A. Fowler, F.R.S. 388

The Scattering of X- and γ-Rays by Rings of Electrons—A Crucial Test of the Electron Ring Theory of Atoms. By G. A. Schott, B.A., D.Sc., Professor of Applied Mathematics, University College of Wales, Aberystwyth. Communicated by Sir J. Larmor, F.R.S. 395

A Note on Dr. Chree's Recent Discussion of Two Magnetic Storms. By S. Chapman, M.A., D.Sc., F.R.S., Professor of Mathematics and Natural Philosophy in the University of Manchester 424

An Explanation of Criticisms on Dr. S. Chapman's Recent Paper, "An Outline of a Theory of Magnetic Storms." By C. Chree, Sc.D., LL.D., F.R.S. 426

No. A 680.—February 3, 1920.

The Measurement of Magnetic Susceptibilities of Low Order. By Ernest Wilson, M.Inst.C.E., M.I.E.E., Siemens Professor of Electrical Engineering in the University of London. Communicated by Prof. J. W. Nicholson, F.R.S. 429

On the Variations of Wave-length of the Oscillations Generated by Three-electrode Thermionic Tubes due to Changes in Filament Current, Plate Voltage, Grid Voltage or Coupling. By W. H. Eccles, D.Sc., and J. H. Vincent, M.A., D.Sc. Communicated by Prof. W. H. Bragg, C.B.E., F.R.S. 455

Equal Parallel Cylindrical Conductors in Electrical Problems. By F. J. W. Whipple, M.A. Communicated by Dr. C. Chree, F.R.S. 465

OBITUARY NOTICES OF FELLOWS DECEASED.

Sir William Crookes (with portrait) i
Sir Joseph Wilson Swan (with portrait) ix
George Carey Foster xv

Index xix